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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/663,948

09/16/2003

Rajesh Tiwari

TI-36211

3857

23494

7590

03/17/2005

TEXAS INSTRUMENTS INCORPORATED

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EXAMINER

CAO, PHAT X

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 03/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	Application No. 10/663,948	Applicant(s) TIWARI ET AL.	
	Examiner Phat X. Cao	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 November 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) 5-8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:  
         1. ☐ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                        |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                            | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

**DETAILED ACTION**

***Election/Restrictions***

1. Applicant's election without traverse of Group I, claims 1-4 and 9 in the reply filed on 11/29/04 is acknowledged.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Shimizu (US. 6,433,432).

Regarding claim 1, Shimizu (Figs. 3H-3K) discloses a method of forming a copper interconnect layer, comprising: forming a first copper region 10 (column 4, lines 54-56) over a semiconductor substrate 1; forming a low K dielectric layer 12 (column 5, lines 27-30 and column 1, lines 16-21) over the copper region 10; forming a plurality of vias 12a in a first region of the low K dielectric layer 12; forming a trench 16 with a first edge 13 in the low K dielectric layer 12 over the plurality of vias, wherein the trench 16 extends a minimum length 12b beyond the edge 13 of a via closest to the first edge of the trench; and filling the trench 16 and the plurality of vias with copper 14 (column 5, lines 60-62).

Regarding claim 2, Shimizu's Fig. 3J further discloses that the trench 16 is formed with a first depth d1 in the first region and a second depth d2 at the trench edge 12b when d1 is greater than d2.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 3-4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US. 6,433,432) in view of Watanabe et al (US. 2003/0227089).

As discussed in details above, Shimizu (Figs. 3H-3K) substantially reads on the above claims, except it does not disclose that the plurality of vias are separated by a distance less than 1.0  $\mu\text{m}$ .

However, Watanabe (Figs. 24B-24C) teaches the forming of an integrated circuit copper interconnect having a trench 603 and a plurality of vias 602, the plurality of vias 602 are separated by a distance of 0.6  $\mu\text{m}$  (par. [0175]). Accordingly, it would have been obvious to separate the plurality of vias of Shimizu with a distance as set forth above because such distance is not critical, it can be adjusted depending upon the width which is desired for the wiring patterns, as taught by Watanabe (par. [0175]).

Shimizu does disclose that the trench 16 extends a minimum length 12b beyond the edge of a via closest to the first edge of the trench 16 (Fig. 3J and column 5, lines 48-51) for preventing the peeling-off of the plugs from the metal wiring (column 8, lines

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25-32), but does not disclose the trench 16 extending a minimum length beyond the edge of a via in a range as claimed. However, it would have been obvious to extend the trench of Shimizu beyond the edge of a via closest to the first edge of the trench with a minimum length as claimed because such minimum length would provide the same effects of preventing the peeling-off of the plugs from the metal wiring.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571) 272-1703. The examiner can normally be reached on Monday - Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC  
March 14, 2005

  
PHAT X. CAO  
PRIMARY EXAMINER